COUNTY OF LOS ANGELES
OFFICE OF THE COUNTY COUNSEL

648 KENNETH HAHN HALL OF ADMINISTRATION
500 WEST TEMPLE STREET
LOS ANGELES, CALIFORNIA 90012-2713

MARY C. WICKHAM
County Counsel

TELEPHONE
(213) 974-1852
FACSIMILE
(213) 613-4751
TDD
(213) 633-0901
E-MAIL
skuhn@counsel.lacounty.gov

June 28, 2018

California Public Utilities Commission
Energy Division
505 Van Ness Avenue
San Francisco, CA 94102
Email: AlisoCanyonOII@cpuc.ca.gov

RE: Comments on the June 15, 2018 *Administrative Law Judge's Ruling Requesting Informal Feedback on the Energy Division's Updated Proposed Phase 1 Scenarios* ("Ruling").

Dear Energy Division Staff:

The County of Los Angeles ("County") appreciates the opportunity to provide comments on the June 15, 2018 *Administrative Law Judge's Ruling Requesting Informal Feedback on the Energy Division's Updated Proposed Phase 1 Scenarios* ("Ruling"). The Ruling seeks to solicit the feedback from parties so that the models can be developed as transparently as possible so that parties, no matter their resources, can use modeling results to develop their arguments on the future of Southern California Gas Company's ("SoCal Gas") Aliso Canyon Natural Gas Storage Facility ("Aliso Canyon"). (*See* Ruling, p. 3.)[1]

[1] The County notes that on April 16, 2018, it, along with other parties, filed timely comments on the April 4, 2018 *Administrative Law Judge's Ruling Announcing Contract with Los Alamos National Laboratory, Ordering Southern California Gas Company to Undertake Hydraulic Modeling* ("Hydraulic Modeling Order"). In its comments, the County objected to allowing an interested party to participate in hydraulic modeling, especially since SoCal Gas has uniformly and aggressively advocated to reopen Aliso Canyon without constraints. The County renews its objection because, at the very least, using SoCal Gas will likely place the Commission in the unfortunate position of having a perceived cloud of suspicion over any final decision issued in this proceeding. The County and other parties offered a reasonable range of alternatives to avoid this inherent conflict but it is unclear whether any consideration was given to any comments submitted on the Hydraulic Modeling Order. The County further notes that while it and other parties timely filed and served comments on the April 4, 2018 Hydraulic Modeling Order, none of those comments have posted to the Commission's electronic docket as of the date of these comments.

In response to the Ruling, the County reviewed the updated proposed scenarios and conferred with its consultant, Energy+Environmental Economics, to develop comments. Those comments are attached hereto as Attachment A. We appreciate the opportunity to provide these comments and we look forward to participating in the upcoming Proposed Phase 1 Scenarios workshop.

Very truly yours,

MARY C. WICKHAM
County Counsel

By SCOTT KUHN
Acting Assistant County Counsel
Affirmative Litigation & Consumer Protection Division

SK:mpg

Attachment A

Energy+Environmental Economics
101 Montgomery Street | Suite 1600 | San Francisco, CA 94104 | 415.391.5100 | www.ethree.com

From: Arne Olson, Nick Schlag and CK Woo, E3

To: Jason Ackerman, Best Best & Krieger LLP
Scott Kuhn, County of Los Angeles

Re: Comments on Energy Division's Proposed Phase 1 Scenarios: I.17-02-002

Date: June 26, 2018

This memo provides E3's technical comments in response to the June 15 ALJ Ruling.

Introduction

The CPUC Energy Division (ED) has proposed an analytical framework for the studies needed to evaluate the implications of reduced Aliso Canyon operations on natural gas and electric system reliability and economics. ED proposes to undertake three studies to inform the investigation:

1. Hydraulic modeling of natural gas system reliability;
2. Production cost modeling of electric system reliability and costs; and
3. Econometric modeling of the impact on natural gas commodity costs.

The County's comments are structured into three sections in response to the three proposed modeling efforts. The County continues to retain Energy and Environmental Economics, Inc. (E3) as its consultant in this docket, and E3's insights have contributed to these comments.

Hydraulic Modeling

The County offers the following comments on the proposed hydraulic modeling.

A. The County is pleased that ED has retained Los Alamos National Laboratory to assist with hydraulic modeling of the SoCalGas system but maintains its position that SoCal Gas should not participate in running the model.

B. ED proposes to conduct hydraulic modeling using the two related reliability standards that govern the SoCalGas natural gas system in California:

    1. 1-in-10 year analysis, in which no curtailment of any gas load is allowed; and
    2. 1-in-35-year analysis, in which curtailment of all non-core demand (including electric loads) is allowed.

C. In order to focus the scope of the current inquiry, the County agrees that the hydraulic modeling should evaluate the ability of the system to meet these established standards under reduced Aliso Canyon operations. However, this should not be construed as explicit or implicit endorsement of these standards for natural gas reliability more generally, and the County reserves the right to comment separately on the issue of natural gas reliability standards.

D. As it relates to the Reliability and Feasibility Assessments, the County does not understand the Commission's proposal to examine 1-in-10 and 1-in-35 weather events on a monthly basis. The County's understanding of the planning standards for the SoCalGas system is that the "1-in-10" and "1-in-35" criteria refer to the likelihood of experiencing such an extreme event on an annual basis, rather than an expected likelihood within each month. The County has concerns that applying these criteria to monthly, rather than annual, events, deviates from the standards to which the system has historically been planned and designed. The County is also concerned that extending the interpretation of such events to each month creates potential for ambiguity in interpretation: for instance . what is the meaning of a 1-in-35-year weather event for a specific month, say, April? Does this mean:

    1. A cold-weather event that would be expected to occur during April three times per century, or
    2. A cold-weather event that would be expected to occur anytime during the year three times per century, which happens to occur in April?

    The County observes that there is a significant difference in the severity of the cold-weather events as between these two different definitions. To avoid creating such ambiguity and adding unnecessary complexity, the County recommends that the Commission focus its analysis on an interpretation of the planning standards on an annual basis, rather than monthly.

E. The County notes that natural gas demand levels for future years must reflect reasonable expectations for natural gas load growth over time. In addition to standard inputs such as anticipated economic and population growth, the load forecast must include:

1. The effect of climate change on the likelihood and severity of extreme weather events (both hot-weather and cold-weather events); and
2. The effect of state policies to reduce greenhouse gas emissions, consistent with the statutory requirement of 40% reductions below 1990 levels by 2030.

F. The County requests that ED develop and provide detailed documentation to support the assumed peak day demand assumptions.

Production Cost Modeling

The County understands that ED proposes to use Production Cost Modeling (PCM), specifically the SERVM model, to represent the electricity sector's use of natural gas within the design day conditions described above. The County offers the following comments on the proposed Production Cost Modeling.

A. The County observes that the use of PCM will vary depending on the study conditions:

   1. For the 1-in-10-year analysis, a representation of electric sector gas demand is required in order to understand whether reduced Aliso Canyon operation is impinging on the system's ability to meet all core, non-core, and electric generator gas demand.
   2. For the 1-in-35-year analysis, representation of electric generator demand is *not required*, since curtailment of all non-core and electric generator demand is allowed.

   Thus, the principal contribution from the PCM modeling to the natural gas reliability modeling will be the electric generator demand for each of the 1-in-10-year analysis days.

B. Accurate characterization of the electric generator demand will require a "day-matching" between the dispatch days selected from SERVM's data library and the 1-in-10 gas demand conditions assumed for the core and non-core demand for the hydraulic modeling. Weighted averages of SERVM dispatch days would not be appropriate for this purpose because they would not include the impacts of the extreme weather that is causing the high demands from core and non-core gas users on the design days. Instead, ED would need to select appropriate days from the SERVM data library based on load or weather distributions. While in principal the data exists to do this, it will require judgment from the modeling team. It will therefore be critical that this step be done transparently and subject to stakeholder scrutiny and comment.

C. A full, 8760-hour production cost modeling exercise would require more extensive day matching as well as additional assumptions about the impact of reduced gas availability. The County understands that the hydraulic modeling will cover only the 1-in-10-year event, in which no electric generator curtailment is allowed, and the 1-in-35-year event in which all electric generator load could be curtailed. However, in order to derive statistically-reasonable estimates of the impact of Loss-of-Load Expectation (LOLE) or Loss-of-Load Hours (LOLH), ED would need estimates of gas generator curtailments for every day. ED would therefore need to extrapolate from those point estimates the impact of reduced Aliso operations on gas availability for each day of the simulated year. ED has not specified how it would undertake this step, and the County has significant concerns about this step.

   Moreover, the County notes that this additional step is not needed for the natural gas system reliability analysis. The existing 1-in-10 and 1-in-35 standards already incorporate electric system reliability considerations.

D. An additional question that the ED may wish to consider is whether treatment of electric generators as fully curtailable under the 1-in-35 standard results in acceptable reliability of the electricity system. SERVM could be useful for conducting the electric sector reliability analysis that would be needed to answer this question. This analysis would also require the extrapolations described previously of gas generator curtailments on extreme weather days. This analysis would become more important if the Commission were to entertain scenarios in which the natural gas system does not meet the 1-in-10 and 1-in-35 standards.

E. The County also reiterates concerns expressed a year ago about the accuracy of SERVM's dispatch of individual gas generators in the absence of a nodal representation of the transmission system. These concerns are magnified if reduced operations of Aliso Canyon affect some generators differently than others. Care must be taken so that the SERVM model run used to represent electric sector gas demand under reduced Aliso Canyon operations has reflected these impacts on electric generators and redispatched the electric system accordingly.

F. The County reiterates comments expressed earlier about the need for analysis of the electricity system under the California Independent System Operator's (CAISO) Local Capacity Resource (LCR) program. Reliability of LCR areas is currently evaluated by CAISO using power flow modeling to simulate flows on the transmission network under the most constrained conditions. In particular, LCR analysis examines the ability of local generation resources and the

transmission network to meet a 1-in-10 local peak demand during an N-1 contingency event. ED should work with the CAISO to complete additional power flow analysis to ensure that the resulting dispatches are feasible and meet NERC criteria for a critical LCR area such as the Los Angeles Basin.

In summary, the County believes that there could be a useful role for SERVM in simulating electric generator dispatch on the 1-in10 and 1-in-35 design days used for the hydraulic modeling, subject to the caveats discussed above about identifying specific generators. The use of SERVM for modeling days other than the design days could also potentially be useful but would require significant additional model and data specification.

Econometric Modeling

The econometric modeling proposed by the Energy Division does not directly quantify the impact of Aliso Canyon's closure on the SoCal natural gas price, the SP15 price, or a ratepayer's natural gas and electricity bills. E3 provides specifications for a more transparent setup below. Its electricity price regression's focus is the CAISO's day-ahead market (DAM) that accounts for over 90% of the CAISO's energy trading volume.

A. The SoCal natural gas price regression

Let G_t denote the daily SoCal natural gas price on day t (= 1 for the first day of the sample period, …, T for the last day of the sampler period). As the U.S. natural gas markets are integrated (Woo et al., 2006), an empirically plausible SoCal gas price regression is:

$$G_t = \theta + \delta D_t + \eta H_t + \mu_t; \quad (1)$$

where D_t = 1 if Aliso Canyon is **unavailable** on day t, 0 otherwise; H_t = Henry Hub price on day t. The intercept θ measures the locational difference between the SoCal and Henry Hub prices. Expected to be positive, the coefficient δ measures the impact of Aliso Canyon's closure on the SoCal gas price. The coefficient η is likely close to 1.0, reflecting that the SoCal and Henry Hub markets are integrated with almost perfect price correlation. The error term is μ_t, which may be serially correlated and heteroskedastic. Eq. (1) can be readily estimated using PROC AUTROREG of SAS (2004).

B. The SP15 electricity price regression

To estimate the effect of Aliso Canyon's impact on the SP15 DAM price, consider the following hourly electricity price regression (Woo et al., 2016, 2017):

$$P_{ht} = \alpha_{ht} + \gamma F_t + \phi C_t + \nu N_t + \Sigma_j \beta_j X_{jht} + \varepsilon_{ht}; \quad (2)$$

where P_{ht} = SP15 DAM price in hour h = 1, …, 24 on day t.

The right-hand-side (RHS) variable F_t is the day-ahead forecast of the SoCal price on day t based on Eq. (1) and the day-ahead forecast of H_t automatically produced by the stepwise autoregressive method in PROC FORECAST of SAS (2004). The other RHS variables are: (a) C_t = day-ahead forecast of the carbon price on day t; (b) N_t = day-ahead forecast of nuclear capacity available on day t; and (c) X_{jht} = day-ahead forecast of fundament driver j that varies hourly (e.g., SCE's system load, solar and wind generation, or hydro condition). The day-ahead forecasts of these RHS variables can also be automatically generated using PROC FORECAST.

The intercept α_{ht} in Eq. (2) is assumed to be a linear function of the binary indicators for hour-of-day, day-of-week and month-of-year, so as to control for the residual time-dependence of P_{ht} not captured by the other regressors. Further, the coefficient $\gamma > 0$ measures the market-based marginal heat rate, while the coefficient $\phi > 0$ the SP15 price's pass-through of the carbon price. If the marginal generation unit is a CT, a 100% pass-through requires γ = CT's heat rate of 9 MMBtu/MWh $\times$ CO_2 emissions of 0.053 metric ton/MMBtu.

The remaining coefficients have the following interpretation. The coefficient $\nu < 0$ is the marginal price effect of nuclear capacity available. The coefficient β_j is the marginal price effect of the hourly-varying driver j. It is positive if driver j is the hourly system load. It is negative if driver j is the hourly renewable generation or hydro condition. Finally, ε_{ht} is the random error, which may be serially correlated and heteroskedastic. Eq. (2) can be estimated using PROC AUTROREG of SAS (2004).

C. The impact on the SP15 electricity price

Recall from Eq. (1) that δ is Aliso Canyon's impact on the SoCal price. Further recall from Eq. (2) that γ is the market-based marginal heat rate, measuring the electricity price increase due to a \$1/MMBtu increase in the SoCal price. Thus, the estimated impact on the SP15 electricity price of Aliso Canyon's closure is $A = d\ g$, where d = estimate for δ based on Eq. (1); and g = estimate for γ based on Eq. (2). To gauge A's precision, one can compute A's standard error using the approximation formula for the product of two random variables in Mood et al. (1974).

D. The bill impact of Aliso Canyon's closure

Let R denote the average retail rate for natural gas, the sum of R_1 = commodity charge and R_2 = non-commodity charge. At Q = retail natural consumption, a retail natural gas bill is $B = R\ Q$.

The percent change in B due to a one-percent change in R_1 is:

$$Y = \partial \ln B / \partial \ln R_1 = \partial \ln R / \partial \ln R_1 + (\partial \ln Q / \partial \ln R)\,(\partial \ln R / \partial \ln R_1). \quad (3)$$

Eq. (3) can be rewritten as:

$$Y = (1 + E)\,S, \quad (4)$$

because (a) $\partial \ln R / \partial \ln R_1 = S = (R_1 / R)$ is the share of retail rate for commodity; and (b) $(\partial \ln Q / \partial \ln R) = E$ is the own-price elasticity of retail consumption, recently found to be about -0.10 for natural gas and about -0.05 for electricity (Woo et al., 2017b).

Based on Eq. (1), the percent change in R_1 is:

$$r = d / (q + h\,H), \quad (5)$$

where d = estimate for δ; q = estimate for θ; h = estimate for η; and H = monthly average of daily Henry Hub prices. Eqs. (4) and (5) imply that $\Delta = r\ Y$ is the percent impact of Aliso Canyon's closure on a natural gas bill. As the bill impact calculation for electricity is entirely analogous, it is omitted for brevity.

E. Recommendation

To assess the various impacts of the Aliso Canyon's closure, a quick and empirically reasonable way is to employ the following steps: (1) use the daily data for the SoCal price and the Aliso Canyon's availability to estimate Eq. (2); (2) use the market-based heat rate estimates in Woo et al. (2016, 2017a) to compute $A = d\ g$ in Section 3; and (3) use Eq. (5) and elasticity estimates from Woo et al. (2017b) to compute $\Delta = r\ Y$ in Section 4.

To be sure, an improvement of the quick way is to use updated market data to estimate the SP15 DAM price regression given by Eq. (2). Such an undertaking, however, is likely to be time-consuming. Further its results will not have been subject to a rigorous peer review, unlike the extant studies of Woo et al. (2016, 2017a).

F. References

Mood, A.M., Graybill, F.A., Boes, D.C., 1974. Introduction to the Theory of Statistics. McGraw-Hill, New York.

SAS, 2004. SAS/ETS 9.1 User's guide. SAS Institute, Cary.

Woo, C.K., Olson, A., Horowitz, I. 2006. Market efficiency, cross hedging and price forecasts: California's natural-gas markets. Energy 31, 1290-1304.

Woo, C.K., Moore, J., Schneiderman, B., Ho, T., Olson, A., Alagappan, L., Chawla, K., Toyama, N., Zarnikau, J. 2016. Merit-order effects of renewable energy and price divergence in California's day-ahead and real-time electricity markets. Energy Policy 92, 299-312.

Woo, C.K., Chen, Y., Olson, A., Moore, J., Schlag, N., Ong, A., Ho, T. 2017a. Electricity price behavior and carbon trading: new evidence from California. Applied Energy 204, 531-543.

Woo, C.K., Liu, Y., Luo, X., Shiu, A., Zarnikau, J. 2017b. Consumption effects of electricity decarbonization: evidence from California and the Pacific Northwest. Electricity Journal 30(10), 44-49.